Ecological Disturbance Monitoring Using Landsat Time Series Data

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Research Goals and Objectives

- Further characterize land cover status and trends across large regions using the Landsat data archive
- This will include analyzing linkages between Landsat-derived change information with climate data to help understand climate change impact on spectral and ecological changes
- Builds off of existing projects (e.g. LANDFIRE, NLCD)

George Xian (ARTS/USGS EROS Center)

Background:

- Ph.D in Atmospheric Science
- Science lead for the National Land Cover Database (NLCD) project
- Mapping and monitoring of urban change
- Land cover classification and change
- Climate assessment

Examples of change

Gradual Changes

Forest Succession

Spruce Budworm

Sort of In-between Changes

Pine Bark Beetle

Abrupt Changes

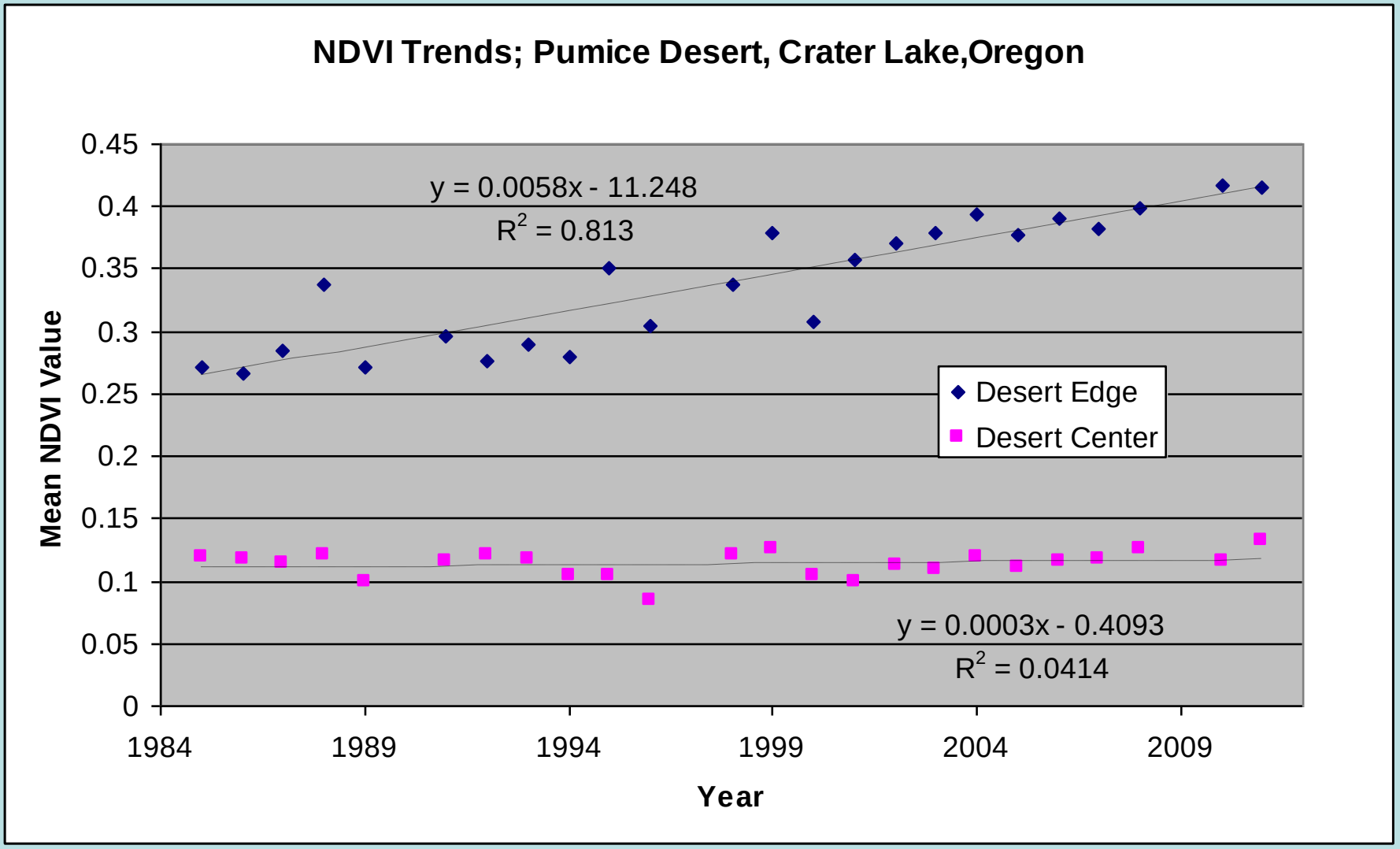
Logging

Wildfire

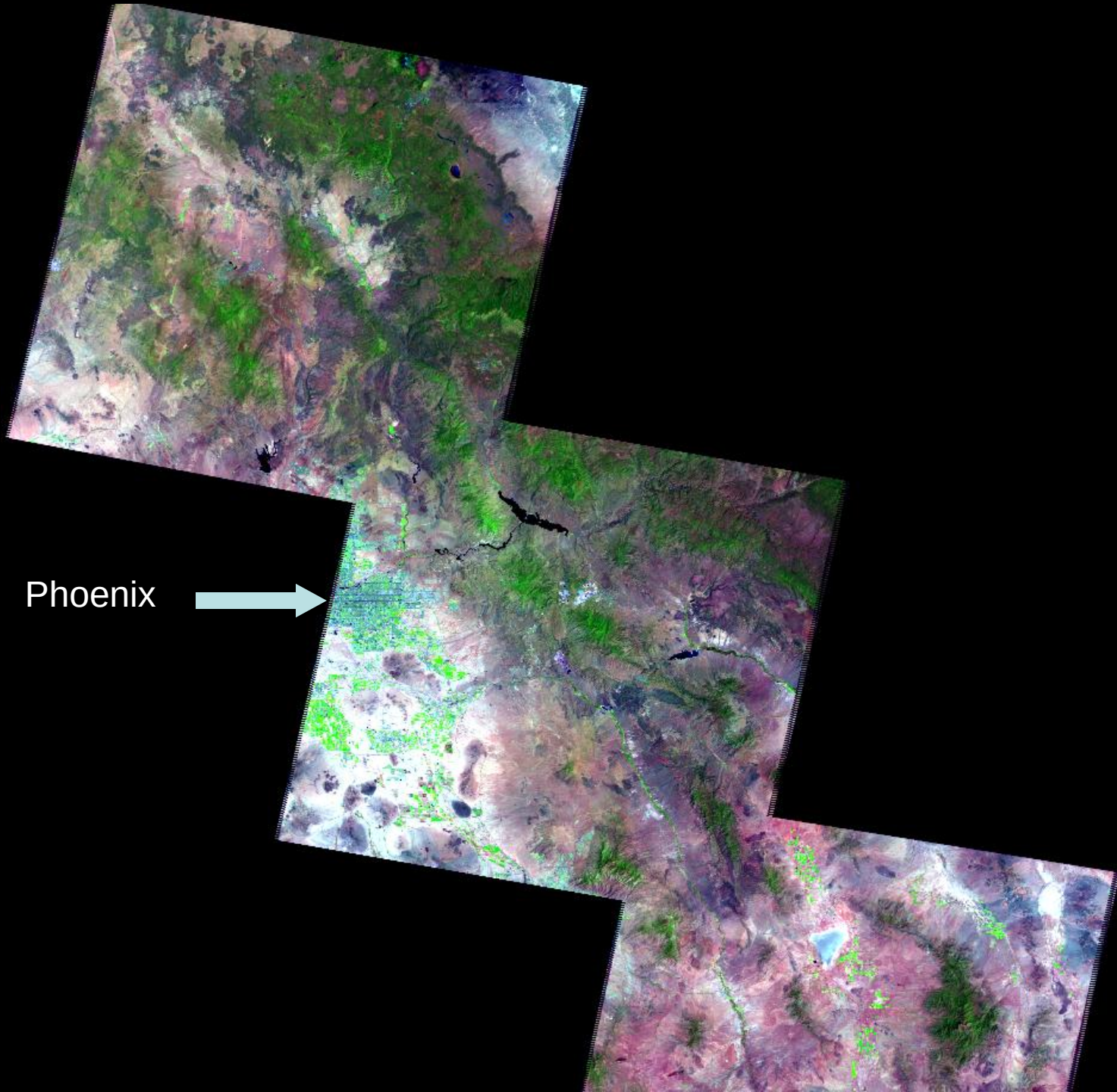
Some specific Objectives

- Assess spatial patterns of gradual natural vegetation changes in US during previous 28+ years using TM/ETM+ (and LDCM)
- Determine relationships between gradual ecosystem change with climate
- Expand gradual change work into MSS era (e.g. 1972-present)
- Explore potential of Landsat for assessing gradual change at global scale

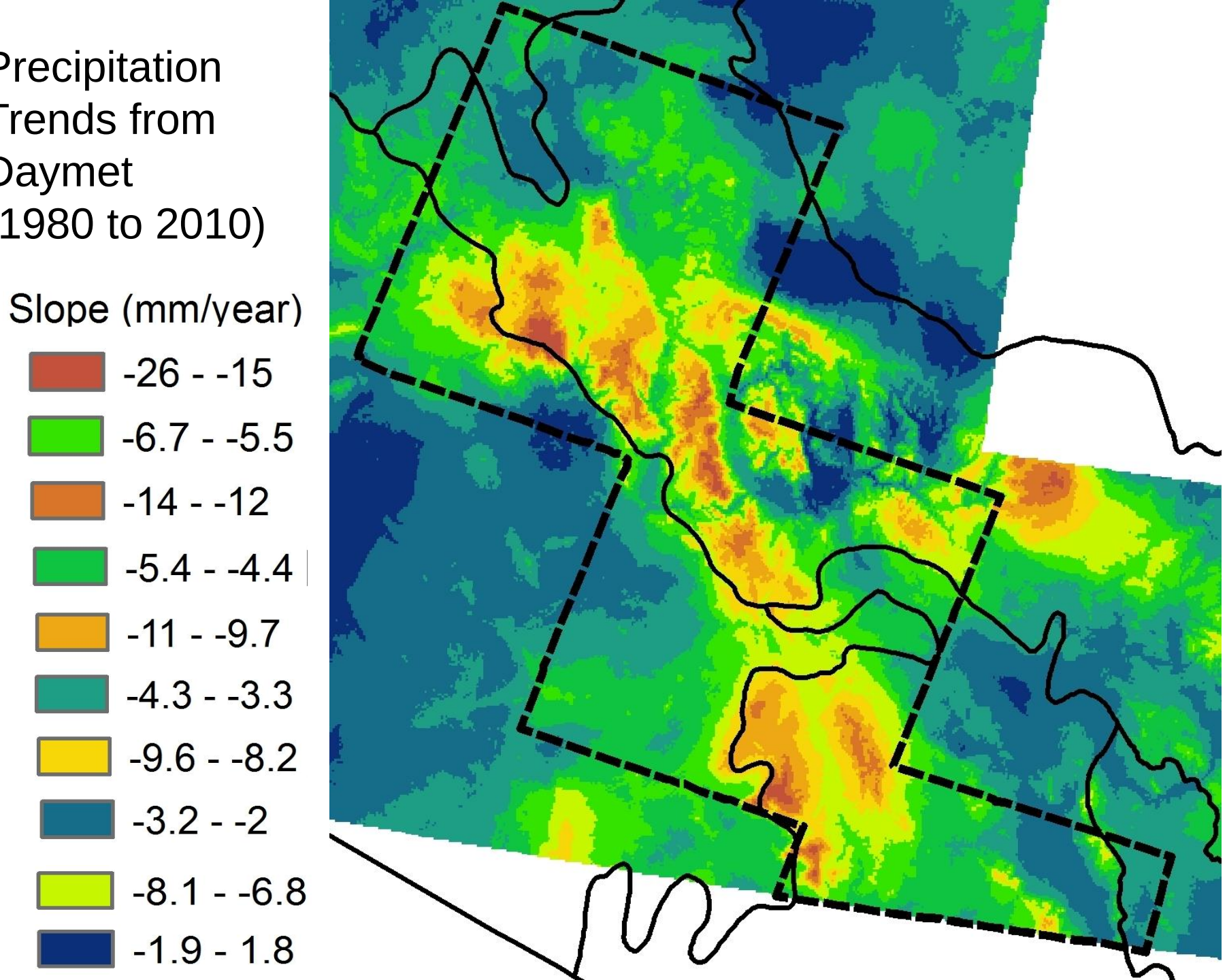
An example of what we're looking for….

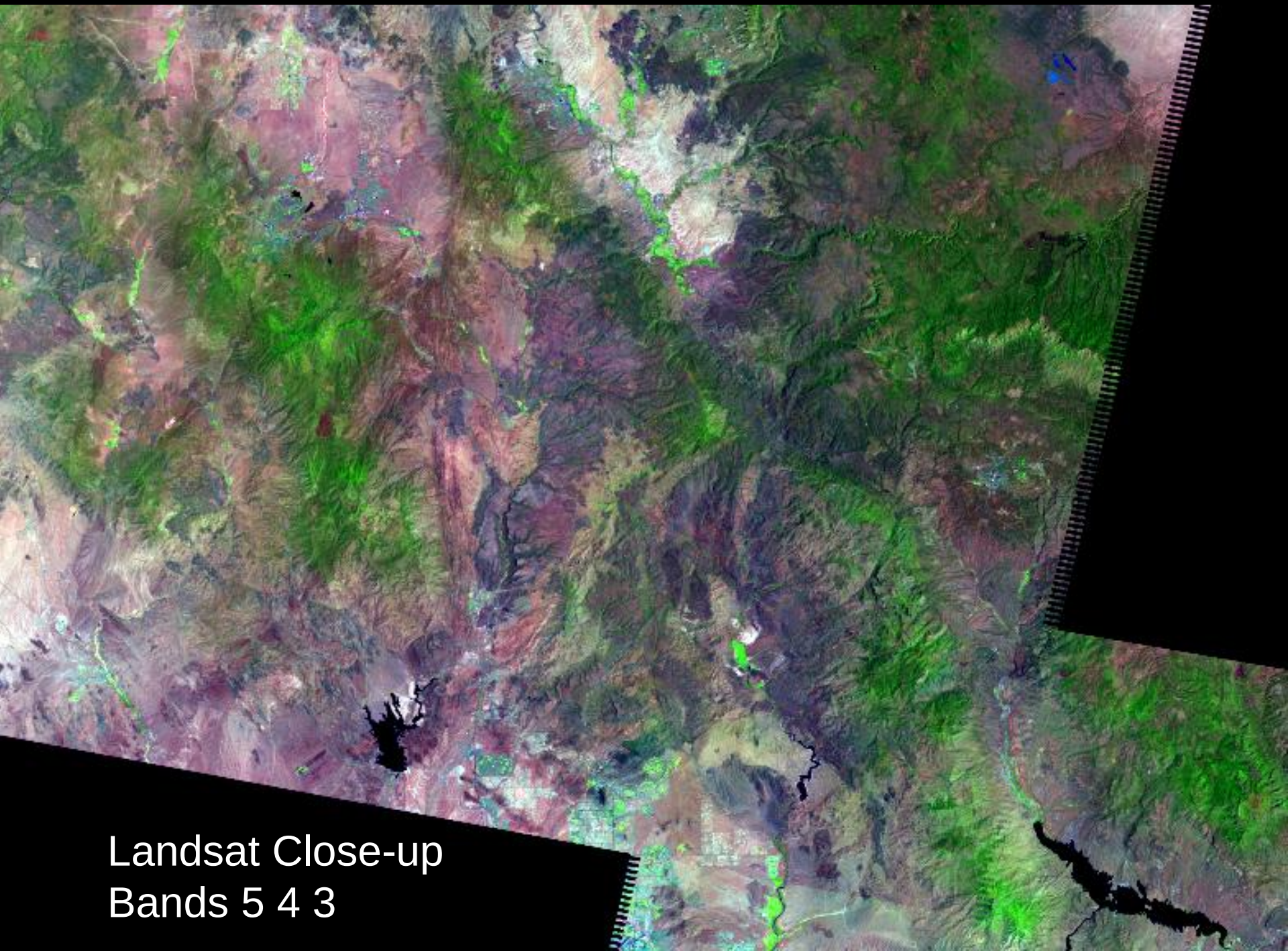


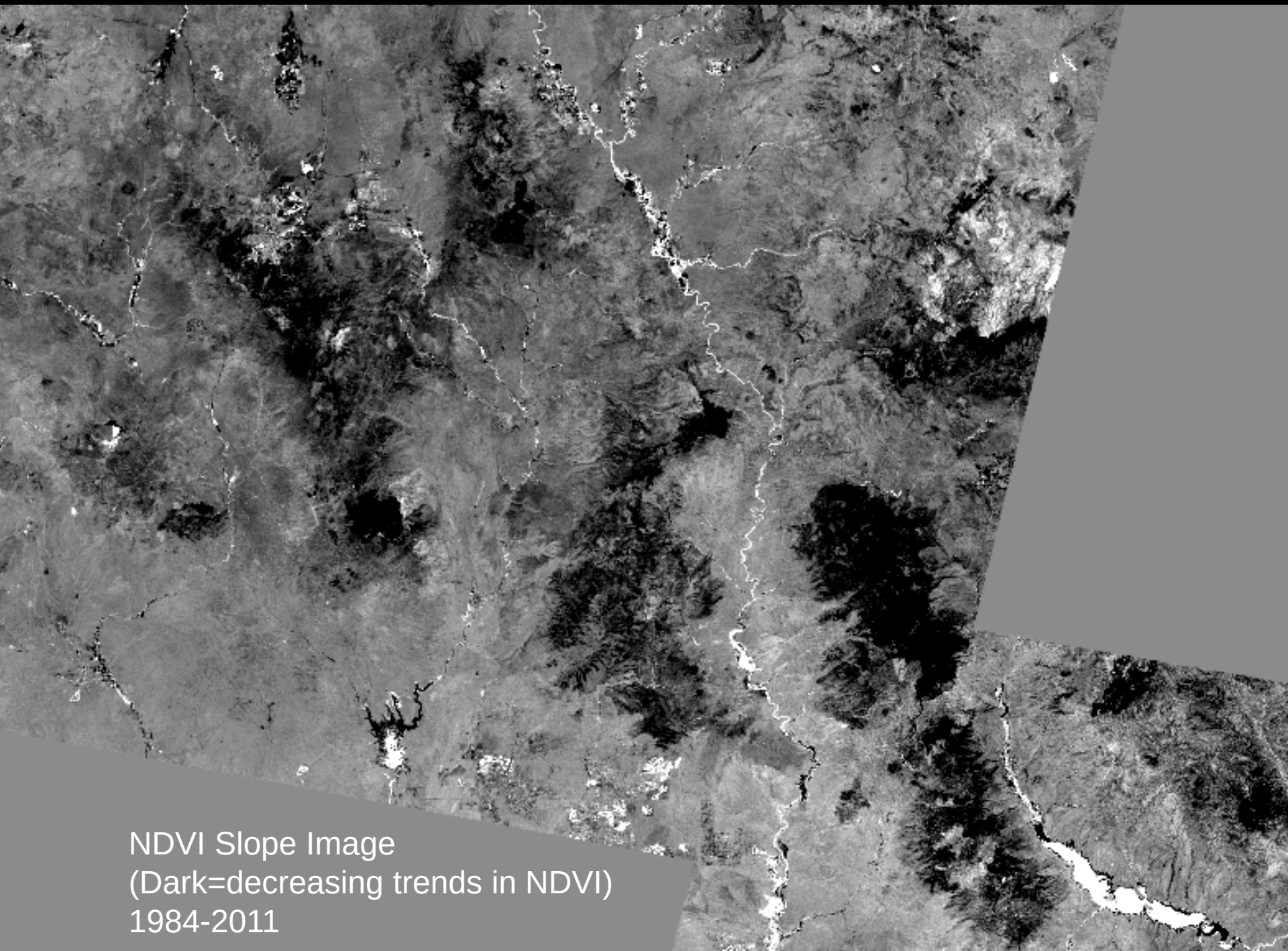
Southern Arizona



Precipitation Trends from Daymet (1980 to 2010)

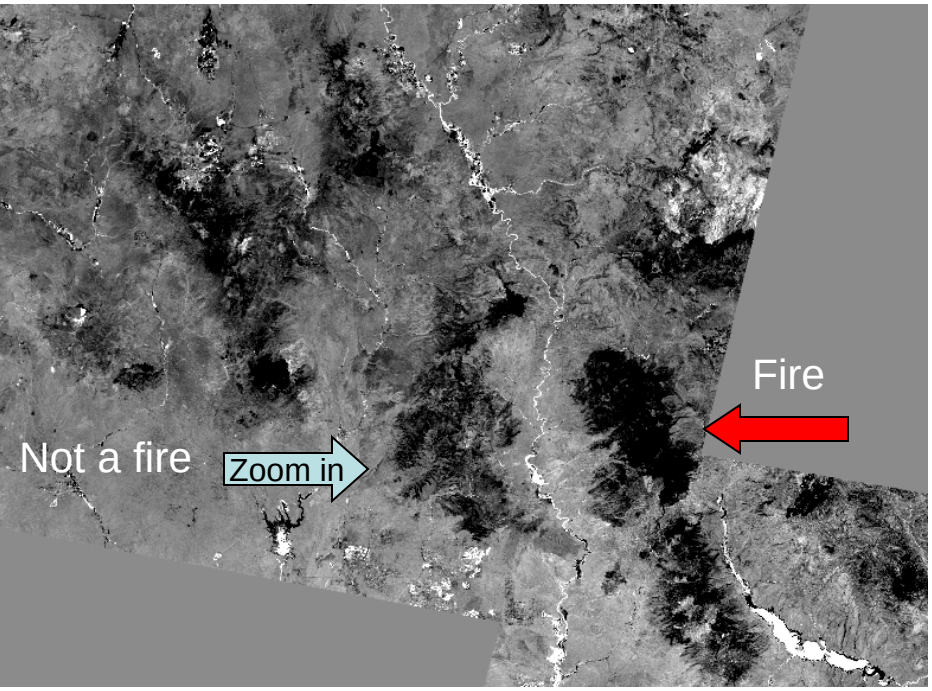



Landsat Close-up
Bands 5 4 3

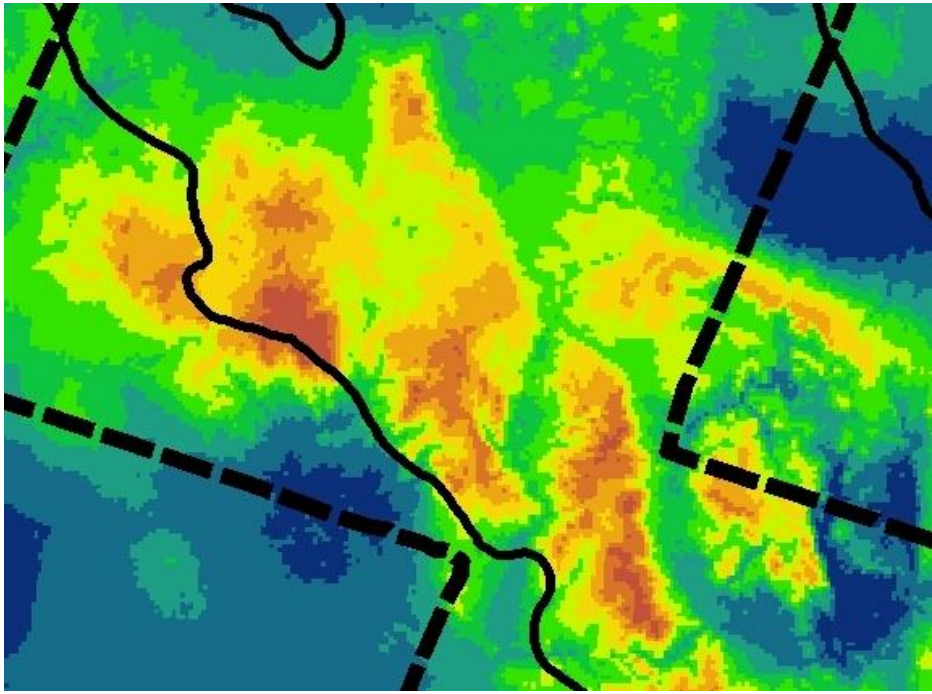


NDVI Slope Image
(Dark=decreasing trends in NDVI)
1984-2011

Comparison between 1984-2011 NDVI trend information and 1980-2000 Daymet precipitation trends data

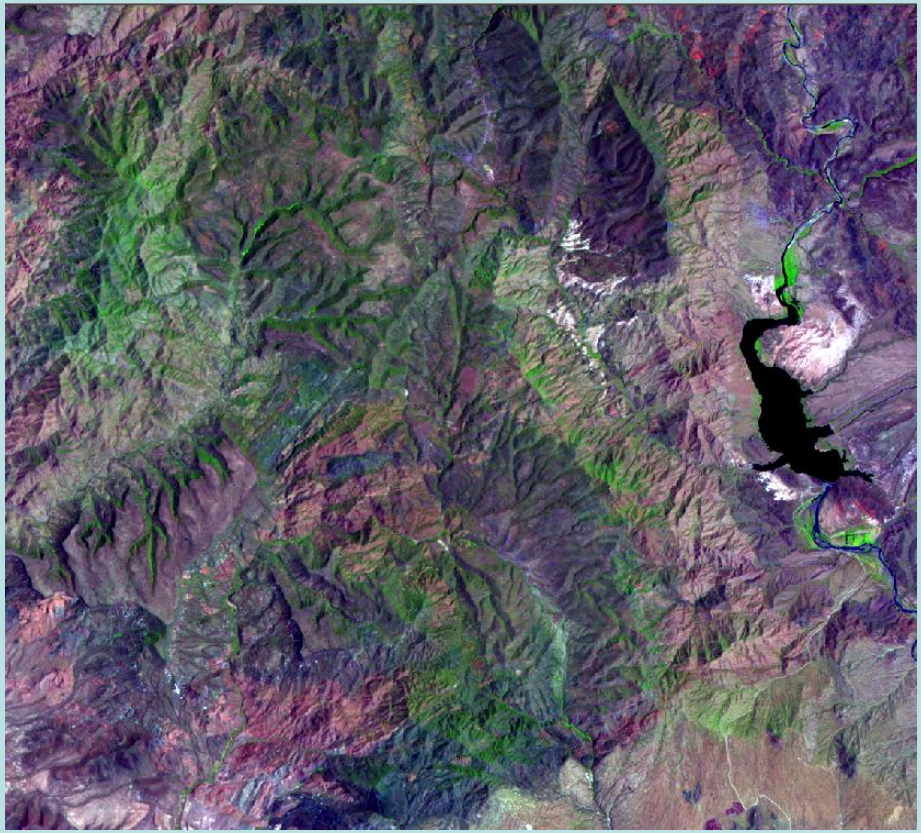


NDVI Slope (dark areas indicate decreasing annual NDVI levels)



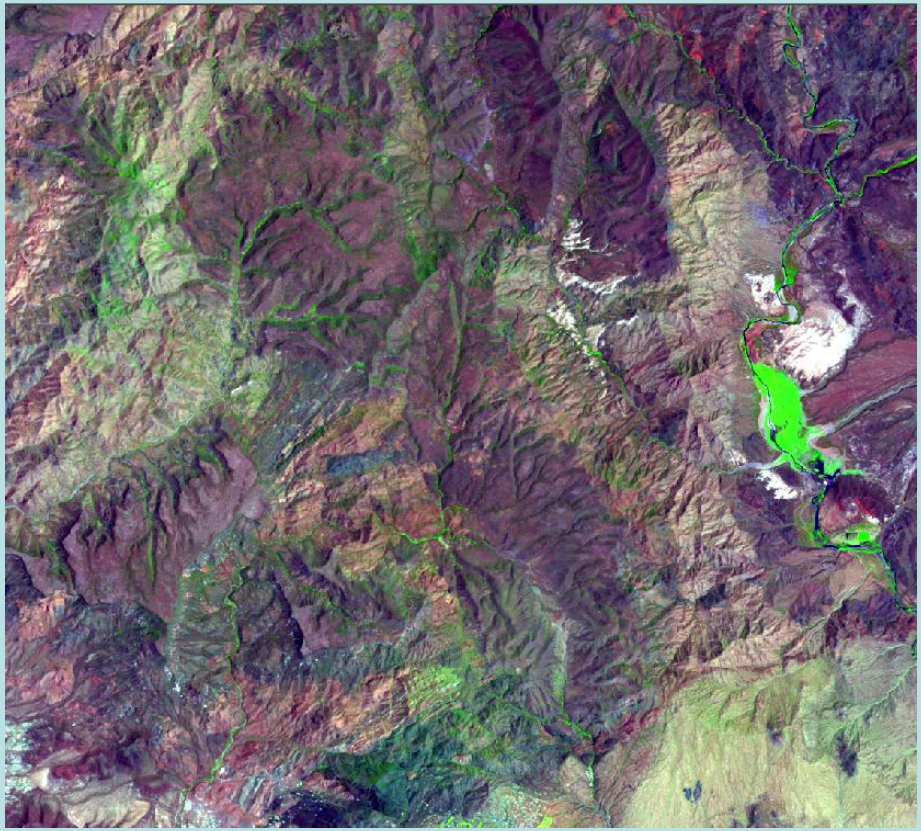
Precipitation Slope (orange/yellow indicate decreasing annual precipitation)

NDVI Slope (1984-2011)



1988

NDVI Slope (1984-2011)



2011

Some General Observations

- Gradual change is pervasive. We have seen evidence of gradual changes in every Landsat path/row assessed thus far.
- Patterns of change that we see can be both intriguing and perplexing. We don’t always know what the changes represent, but we can generally figure it out with additional information.
- Gradual change is often pronounced in ecological transition zones, often associated with mountains
- We are beginning to see relationships between image and climate trends